Modeling Resource Adequacy Impacts of Integrating Intermittent Resources

Astrape Consulting

Kevin Carden

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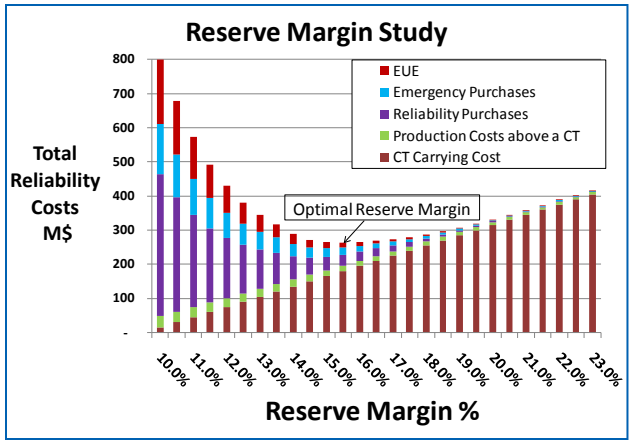
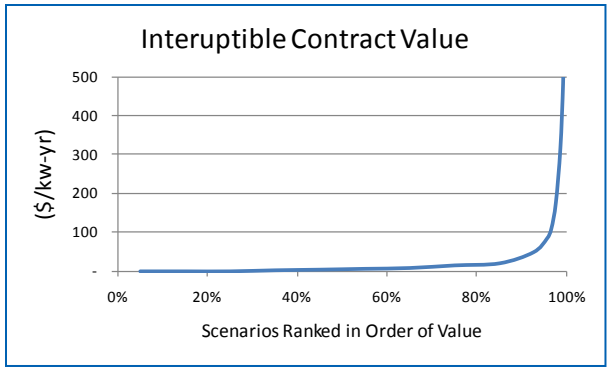
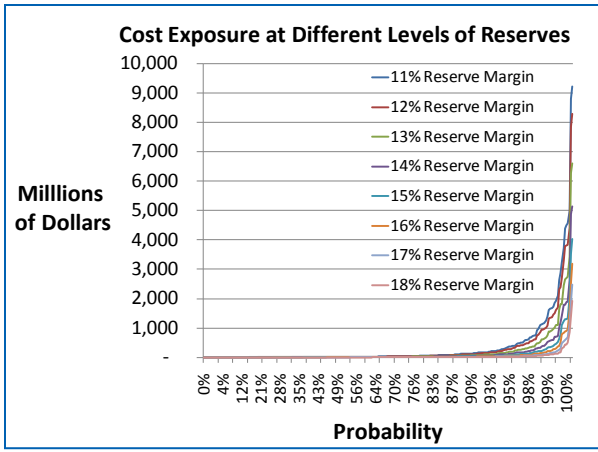
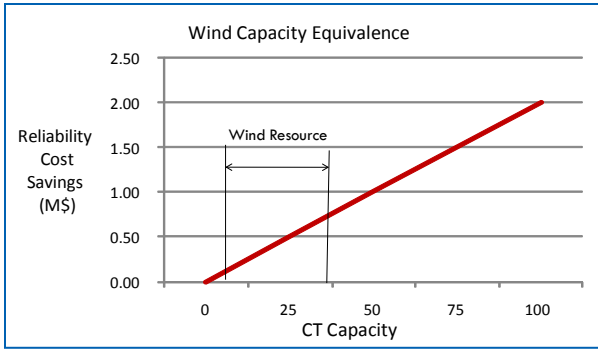
SERVM

- **Provides a risk-based evaluation framework to address the following:**
  - Target Reserve Margin
    - Understanding the full cost exposure at different reserve levels
  - Short Term Purchase Decisions for Upcoming Peak Season
  - Value of Demand Response Programs and Forecasts Interruptible Calls
  - Reliability Impact of a Changing Resource Mix
    - Base Load Coal Retirements
    - Renewable Resource Penetration
    - Demand Side Resource Penetration
  - Other Analysis such as
    - System EFOR improvement
    - Fuel Backup Benefit
    - CBM Benefits
    - Emergency Capacity Available from Neighbors
    - LOLE, LOLP, EUE
    - Mitigating Risks









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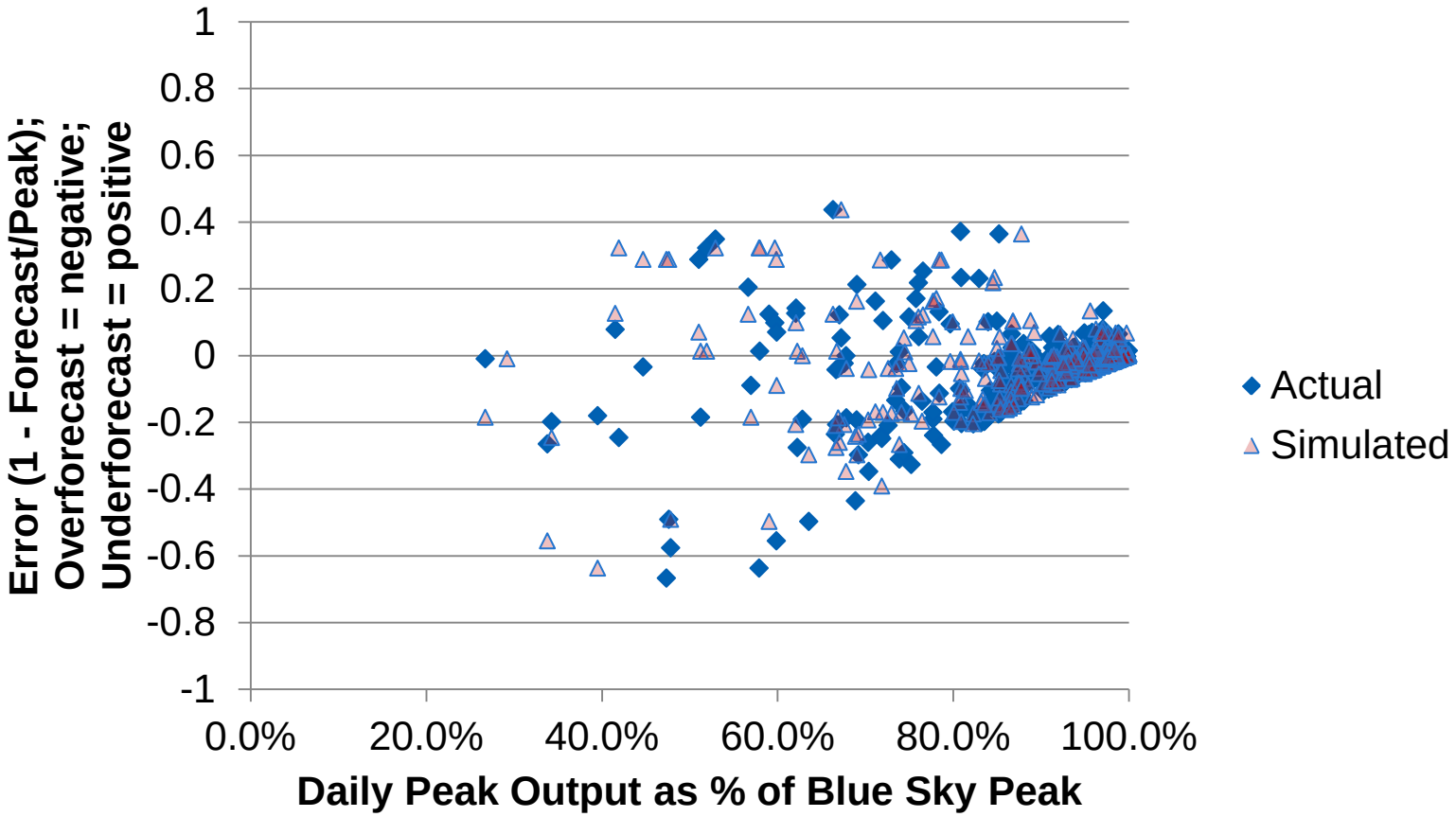
Study Objectives and Assumptions

- **Demonstrate method for measuring the impact of uncertainty on reliability**
- **Analyze the distribution of economic and reliability impacts over wide range of scenarios**
- **Modeled California in 2020 without imports and without internal transmission constraints**
- **Simulated 30 years of solar/wind/load profiles**

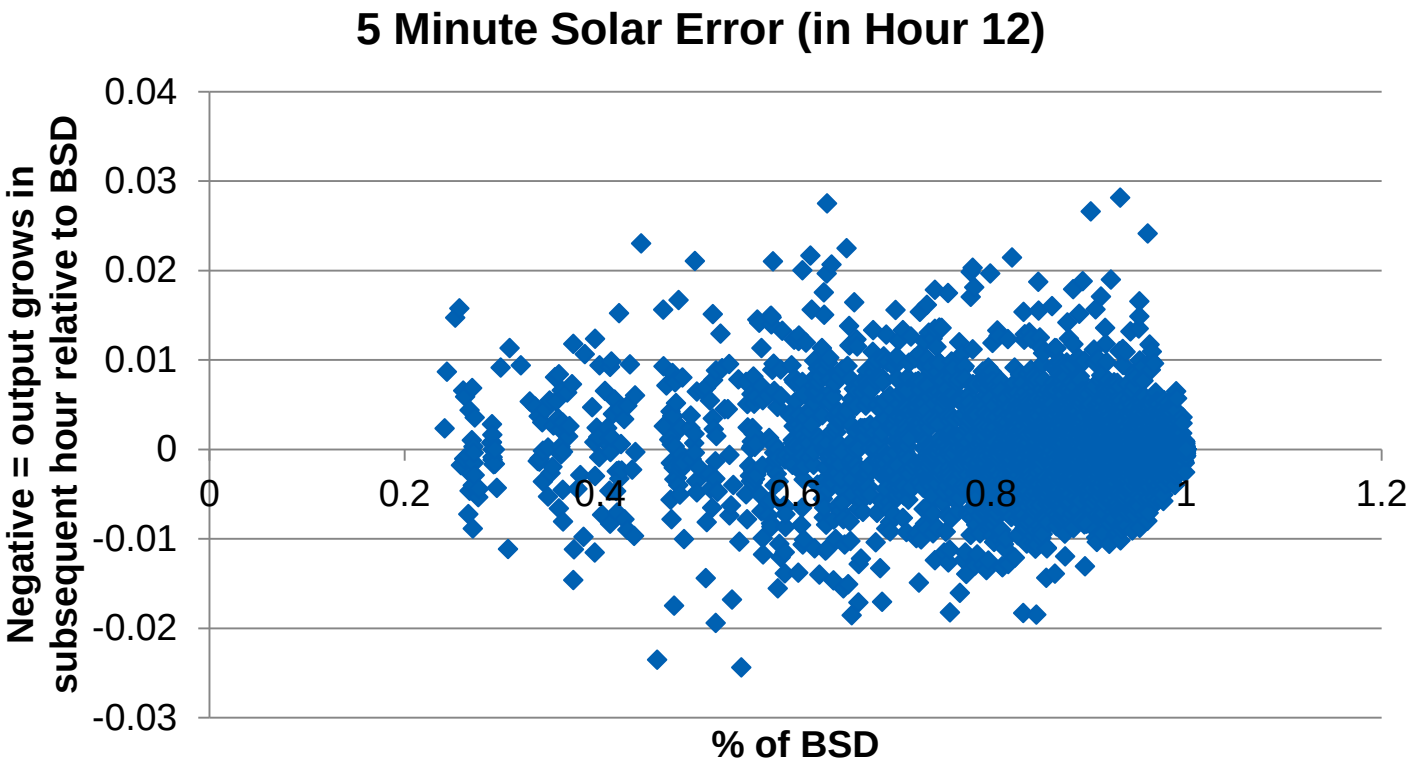
Uncertainty Profiles

- **Day Ahead**

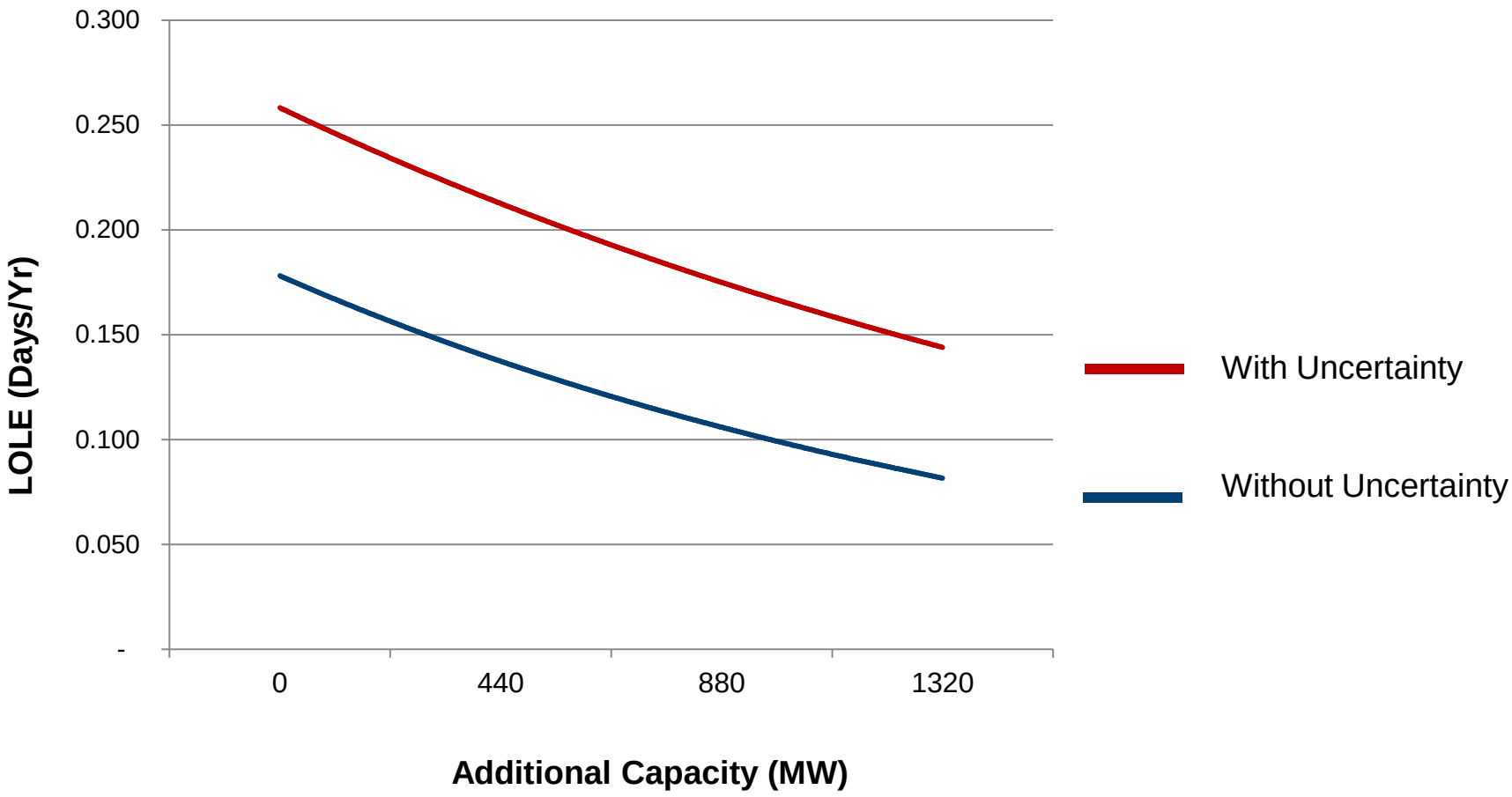


Uncertainty Profiles

- **Intra-Hour**



Reliability Results



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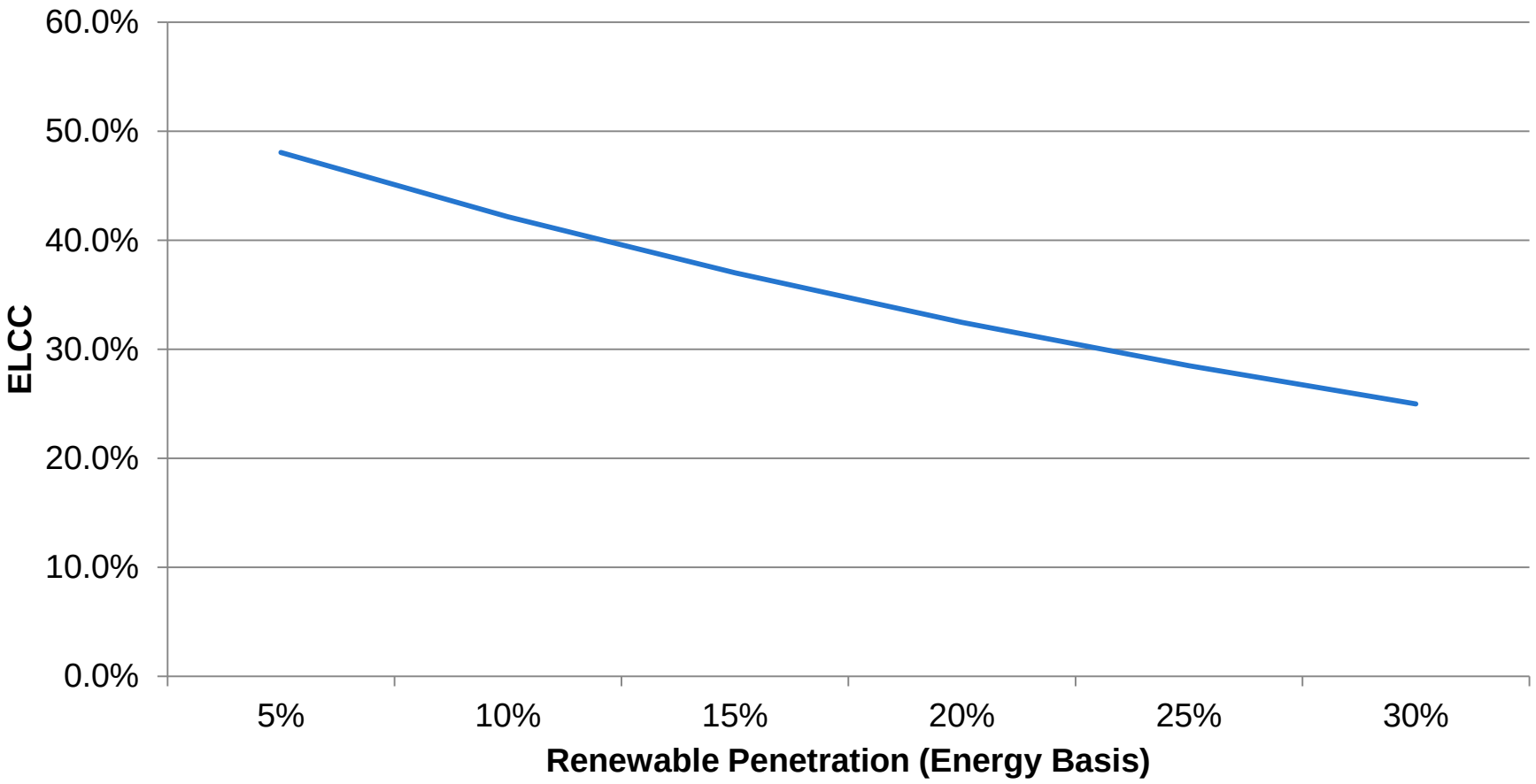
Capacity Credit of Renewable



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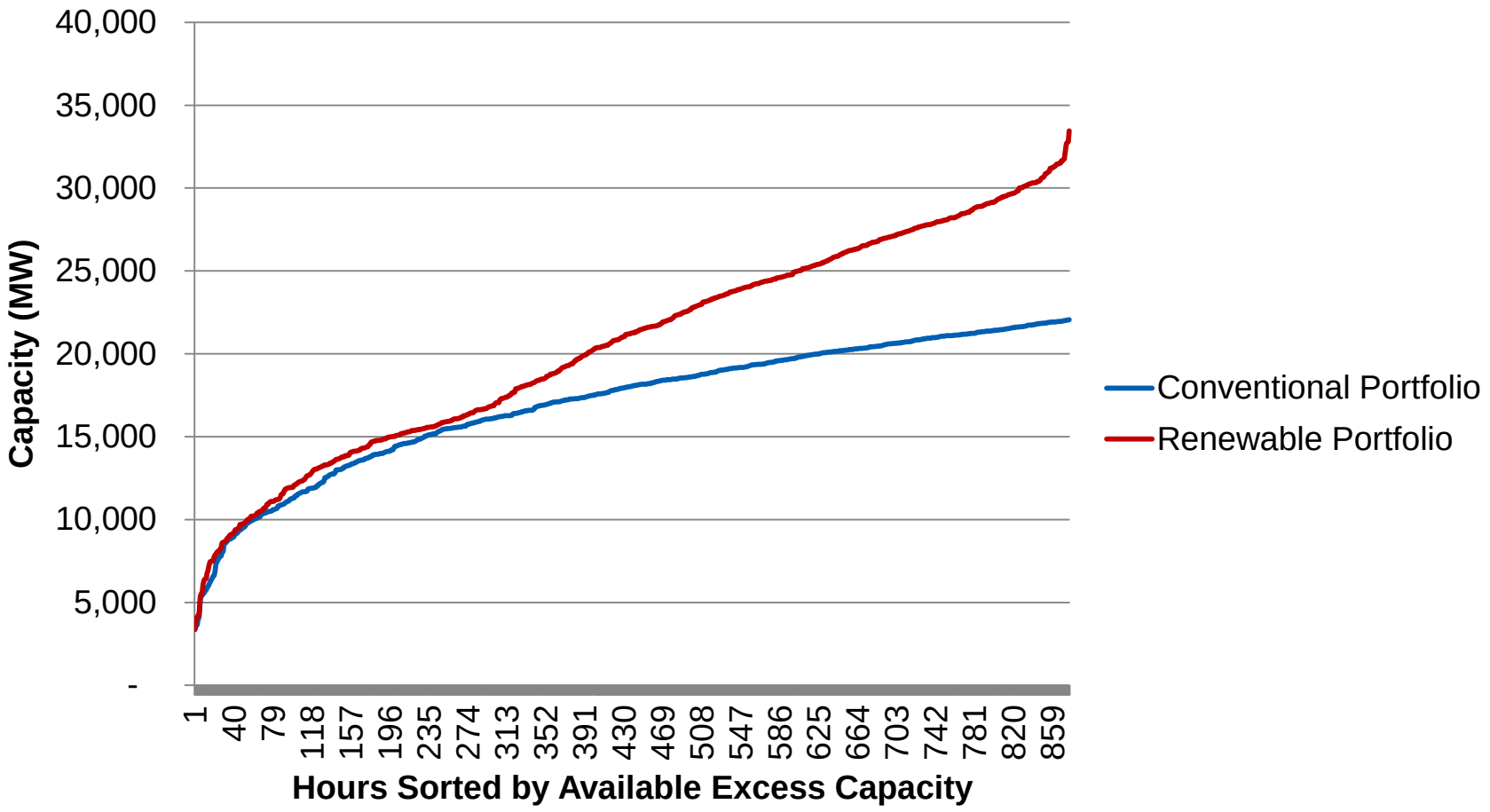
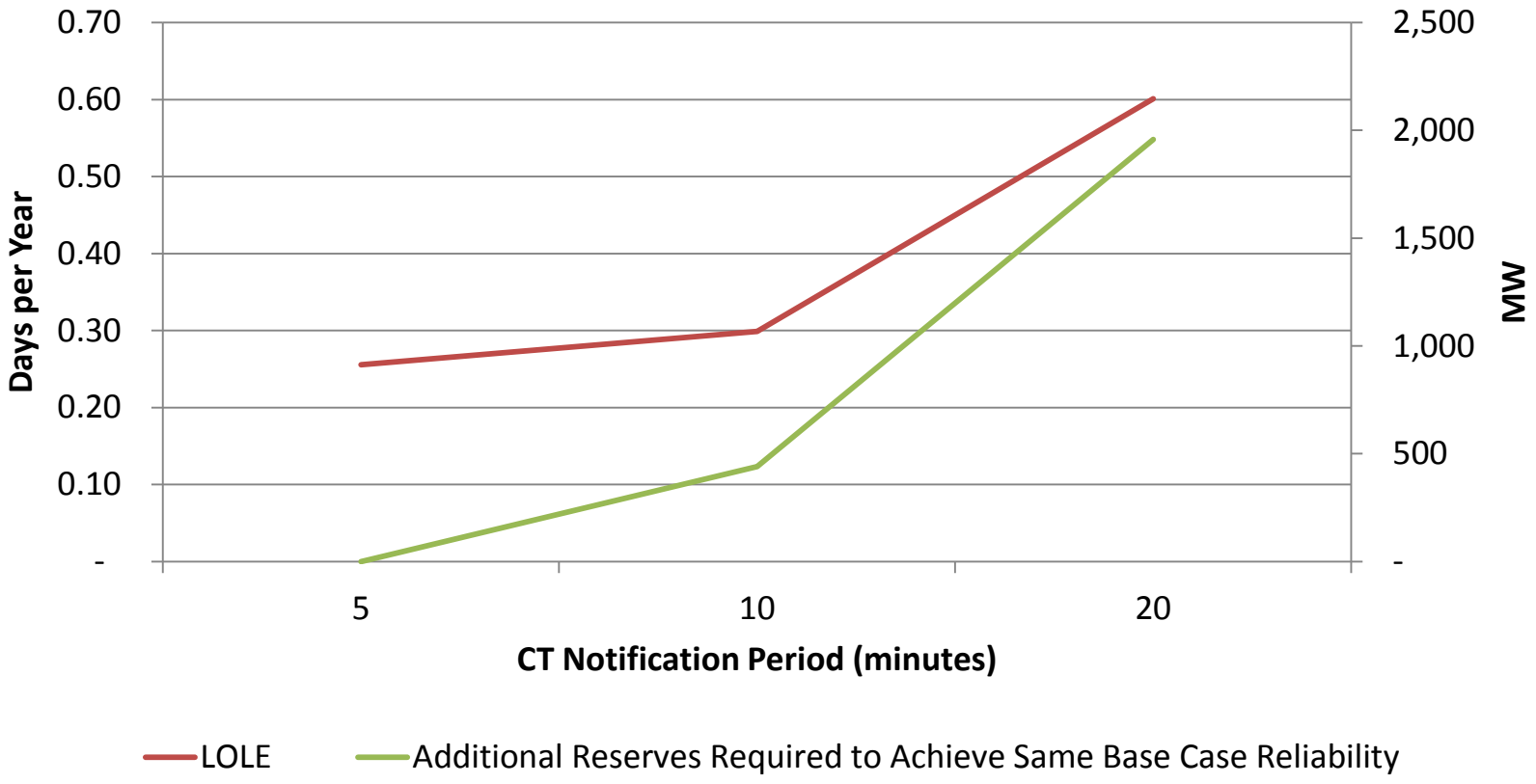
Reserve Duration Curve

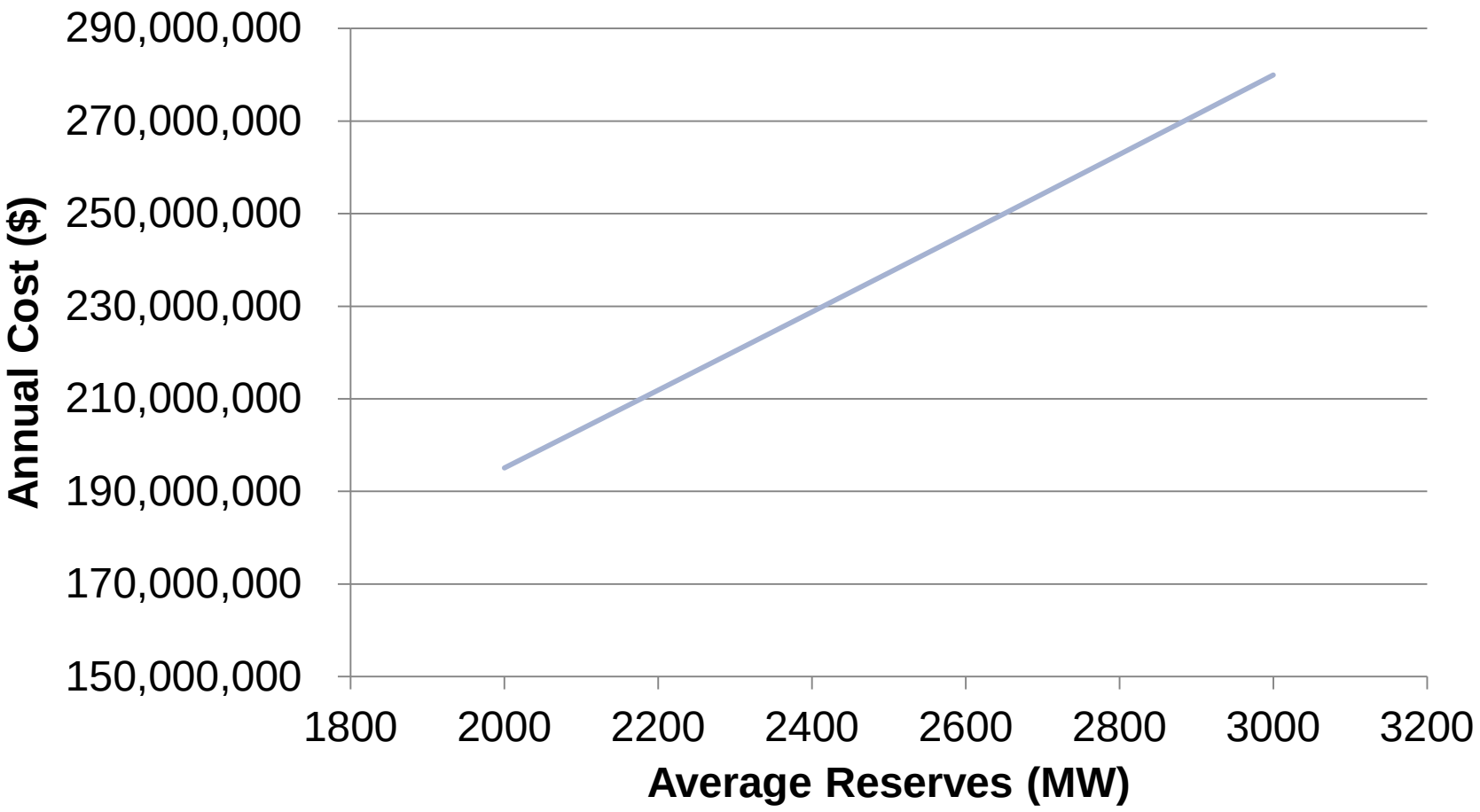


Average Renewable Output in Top 25 Minimum Reserve Hours < 20% of Nameplate.

Impact of CT Response Time On Reliability



Efficiency Cost of Carrying Reserves



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